

Fig. 1

Introduction

The LD200A is a compact size, high efficiency LED driver board that operates the LED backlights in Landmark 8.4" to 15" VHB (very high brightness) LCD modules. It can drive up to two LED strips with a maximum power of about 9 Watts per strip. Each LD200A is factory tuned to drive a specific VHB LCD module before shipping. Mis-matching between the LD200A and the LCD module may damage the LED backlight. Please refer to page 4 for details.

The LD200A operates at a 12V DC input voltage. The LCD screen brightness is adjusted with a DC voltage that is in the same range as the dimming voltage (Vd) for Landmark Inverters. As a result, our standard dimming control circuits such as the ambient light sensor PS200 and the DP064 Digipot work seamlessly with the LD200A. Also, the brightness control LUT (look up table) in the BIOS code of Landmark MG22 and MG21 LCD controller cards work very well with the LD200A.

Absolute Maximum Rating

Parameters	Min.	Max.	Units
Supply Voltage (Vin)	11.0	13.0	Vdc
Operating Temperature Range	-10	60	°C
Storage Temperature Range	-20	80	°C

Recommended Operating Conditions

Parameters	Min.	Typ.	Max.	Units	Conditions
Supply Voltage (Vin)	11.5	12	12.5	Vdc	Note 1
Input Current (I) - LD200A tuned to drive LMG207-121X1-L01, 12.1" VHB LCD module		1.05		Adc	Vin = 12V at 1600 nits LCD screen luminance
LED String Voltage (Vf)			28	Vdc	Max. 8 LEDs per string
ON/OFF Control - OFF	0	0.2		Vdc	
- ON		4.8	5	V dc	
Analog Dimming Voltage (Vd) 100% brightness		4.95	5	Vdc	Note 2
5% brightness		0.55		Vdc	Note 2, Note 3

Note 1 - Please refer to Fig. 5 on page 4 to see the effects of the supply voltage on the LED backlight performances.

Note 2 - For Vd < 0.55V, the LCD brightness stays about the same, then drops to zero at about Vd = 0.12V

Note 3 - LD200A can be specially modified to support dimming characteristics that require Vd from 0 - 3.3V or Vd from 0 - 5V. Please contact Landmark for details.

Connector Pin Assignments

LD200A Input Connector CN1 (Yeonho 12505WR-12A00)			
Pin #	Function	Pin #	Function
1, 2, 3	+12 V DC Input	9	On/Off Control Input
4, 5,	Ground	10	Ground
6	No Connection	11	Brightness Control Input (Note 4)
7, 8	Ground	12	No Connection

LD200A Output Connectors for LED strips - CN2, CN3	JST SM02B-BHS-1-TB
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Note 4 - The brightness control input (pin #11) must be connected to a DC voltage between 0 - 5V. If left un-connected (floating), the LED backlight will be on with an unstable brightness.

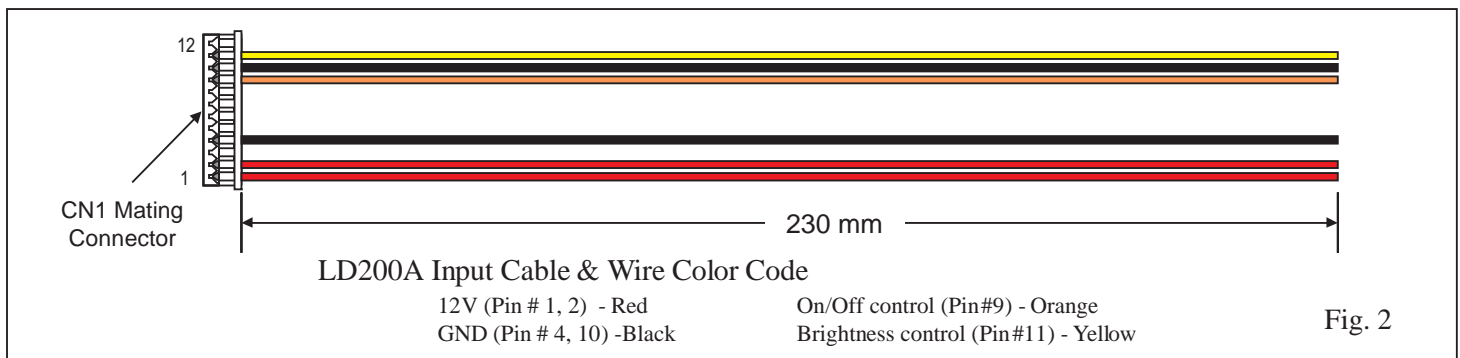


Fig. 2

LCD Screen Brightness Adjustment

The LD200A uses a DC voltage ranging from 0.5 - 5V to control the LCD brightness. This dimming voltage V_d is fed into the drive board at Pin #11 of the CN1 connector.

Typical dimming characteristics with the Landmark 12.1" LMG207-121X1-L01 LCD module is shown in Fig. 3. At $V_d = 5V$, the LCD screen brightness is about 1600 nits and the current from the 12V DC supply is 1.05A. As V_d reduces to 0.6V, the brightness drops to about 80 nits. Thus, the dimming ratio is about 20:1. Within this 20:1 region, the brightness adjustment characteristics are quite stable.

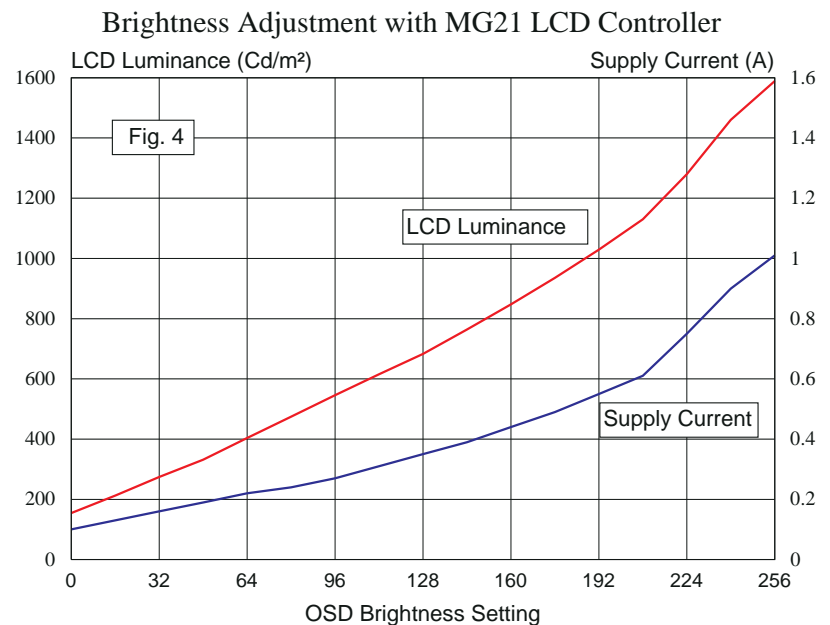
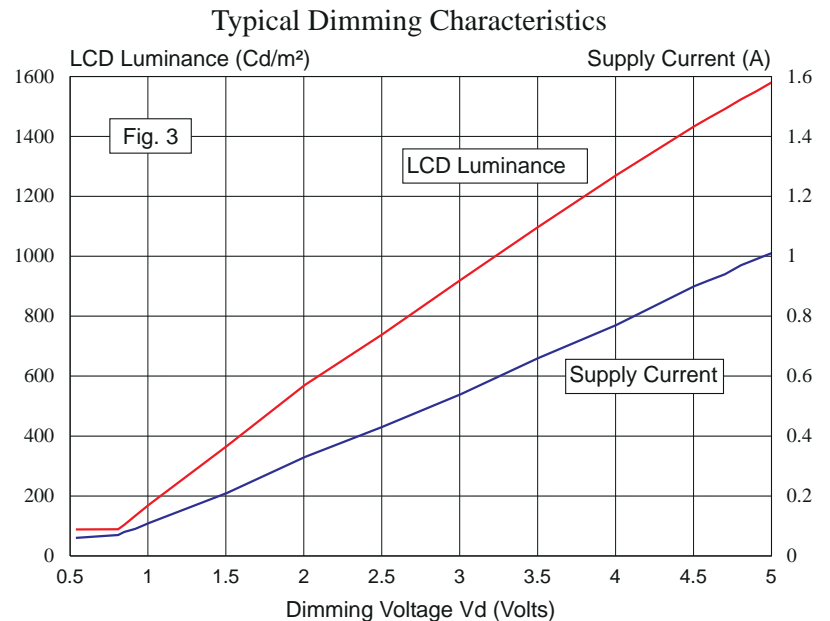
As V_d decreases further below 0.5V, the dimming rate of the LEDs may be inconsistent. With a backlight having a top and a bottom LED strips, the brightness of the LED strips can be different. For this reason, it is not recommended to operate the LD200A with a dimming voltage below 0.5V.

Fig. 4 shows the screen luminance adjustment of the LMG207-121X1-L01 12.1" LCD module using the OSD Brightness setting button of the MG21 LCD controller card. As the OSD Brightness setting changes from 255 to 0, the LCD brightness reduces from 1600 to 130 nits. In the meantime, the supply current reduces from 1.05A to 0.06A.

The LCD brightness can also be adjusted by the following two LM accessory devices:

1. The PS200 ambient light sensor - it generates the dimming voltage V_d based on the ambient light level for automatic screen brightness adjustment.
2. The DP064-DS - a 64-step digital potentiometer that generates the dimming voltage with two push buttons.

These two accessories were originally designed for Landmark inverters. They work very well with LD200A LED drive board since it has a nearly identical dimming characteristics. Please refer to the data sheets of these accessories for the details.

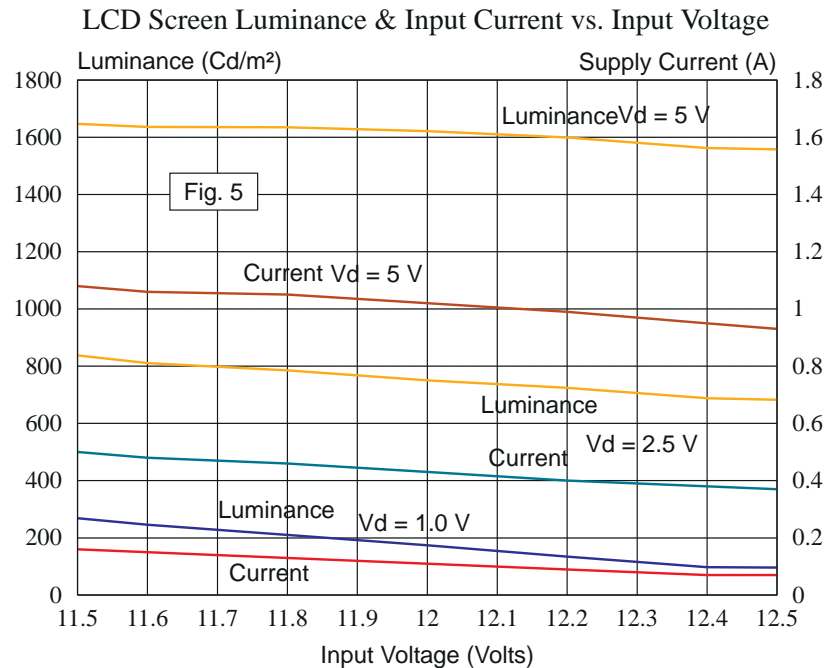


The Effects of Power Supply Voltage

The LD200A can operate with a supply voltage ranging from 11 to 13 V. However, the LED backlight brightness changes somewhat over this voltage range. Fig. 5 below shows the LCD screen brightness versus the supply voltage over the recommended operation range of 11.5V to 12.5V.

At the full brightness setting ($V_d = 5V$), both the luminance and the supply current values drop slightly as the supply voltage increases. As V_d is adjusted down for lower screen brightness, the changes in luminance and current escalate significantly. For example, at a setting of $V_d = 1.0V$, the luminance drops from 270 nits to 97 nits as the supply voltage increases from 11.5V to 12.5V. This is a huge 64% decrease.

As a result of these effects, it is recommended that the supply voltage be set and maintained at 12V closely.



LD200A LED Strip Driving Current Tuning

Each LD200A shipped is factory tuned to a specific driving current of the LED strip (or light bar). This information is on the product label at the back of the board. For example, the label shown on the right side has the part number LD200A-150. Below it has the current rating (2 x 360mA). Then the production date code "28/12". The "-150" after the LD200A specifies that this board is tuned to drive the backlight of a 15" LCD. The current rating indicates that it can drive 2 LED strips with each strip current at 360 mA. Thus, if the strip has 6 strings of LEDs, then the LED current is $360 / 6 = 60$ mA.

P/N LD200A-150
(2 x 360ma)
28/12

Caution: If the LED driving current exceeds the maximum LED current rating by 5% or more, it is possible to cause severe damage to the LED strip.

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